



Robert J. Bayer
Plant Manager

October 14, 2019

WO 19-0049

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555


Subject: Docket No. 50-482: Licensee Event Report 2019-002-00, "Emergency Diesel Generator Inoperable Due to Temperature Control Valve Failure"

To Whom It May Concern:

The enclosed Licensee Event Report (LER) 2019-002-00 is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as an operation or condition prohibited by Technical Specifications, 10 CFR 50.73(a)(2)(v)(A) as an event or condition that could have prevented fulfillment of a safety function needed to shut down the reactor and maintain it in a safe shutdown condition, and 10 CFR 50.73(a)(2)(v)(D) as an event or condition that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident.

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4015, or Ron Benham at (620) 364-4204.

Sincerely,



Robert J. Bayer

RJB/rlt

Enclosure: LER 2019-002-00

cc: S. A. Morris (NRC), w/e
N. O'Keefe (NRC), w/e
B. K. Singal (NRC), w/e
Senior Resident Inspector (NRC), w/e

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LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollcts.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. Facility Name	2. Docket Number	3. Page
Wolf Creek Generating Station	05000 482	1 OF 4

4. Title
Emergency Diesel Generator Inoperable Due to Temperature Control Valve Failure

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
08	19	2019	2019	- 002 - 00		10	14	2019	Facility Name	Docket Number
										05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
100	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER	
Licensee Contact Ron Benham, Manager Nuclear and Regulatory Affairs	Telephone Number (Include Area Code) (620) 364-4204

13. Complete One Line for each Component Failure Described in this Report										
Cause D	System LB	Component TCV	Manufacturer Robertshaw	Reportable to ICES Y	Cause	System	Component	Manufacturer	Reportable to ICES	
14. Supplemental Report Expected					15. Expected Submission Date			Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No										

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On August 19, 2019, at 0223 Central Daylight Time (CDT), during performance of its monthly operability run, the 'A' Emergency Diesel Generator (EDG) was declared inoperable due to high intercooler water temperature. Condition B of Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1, "AC Sources - Operating" was entered at this time. At the time of the event, the unit was in Mode 1 at 100 percent power.

Investigation revealed that the reason for the high intercooler water temperature was the failure of the thermostatic "power pills" in the intercooler heat exchanger temperature control valve. The failed power pills caused the valve to fail in the bypass position, thereby reducing cooling flow through the intercooler heat exchanger. It was determined that the power pills most likely failed prematurely due to accelerated aging induced by annual shelf life testing. Due to the probable cause of failure, there is firm evidence that the condition existed following the previous successful run of the 'A' EDG on July 15, 2019, which is longer than the 72-hour completion time required by TS LCO 3.8.1. In addition, the 'B' EDG was out of service for maintenance for approximately 2 days during this period, so this was also a condition that could have prevented fulfillment of a safety function.

The failed power pills were replaced and the 'A' EDG was returned to service on August 20, 2019, at 0500 CDT. Condition B of TS LCO 3.8.1 was exited at this time. There was no impact to the health and safety of the public as a result of this event.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME		2. DOCKET NUMBER		3. LER NUMBER		
Wolf Creek Generating Station		05000-	482	YEAR 2019	SEQUENTIAL NUMBER 002	REV NO. 00

NARRATIVE**DESCRIPTION OF STRUCTURE(S), SYSTEM(S), AND COMPONENT(S)**

Energy Industry Identification System (EII) codes and component codes are identified in the text as [XX].

Wolf Creek Generating Station (WCGS) has two independent and redundant Class 1E 4.16 kV buses [EB] that supply emergency AC power to safety related systems and components. Under normal operating conditions, the Class 1E buses are provided with power from the preferred (offsite) system through two independent and redundant sources. Each Class 1E 4.16 kV AC bus also has an emergency diesel generator (EDG) [DG] on standby which automatically starts and powers essential safety related loads on its respective buses in the event that there is loss of power to that bus.

Turbochargers on the EDGs provide cooled, forced air for combustion. Turbocharged air is cooled by an intercooler prior to its entry into the combustion air manifold. The intercooler cooling water system [LB] is a closed loop cooling system which is cooled by essential service water (ESW) in the intercooler heat exchanger [HX]. The intercooler cooling water circulates on the shell side of the heat exchanger, while ESW flows through the tubes. The temperature of the intercooler cooling water is controlled by the use of a temperature control valve [TCV] which directs the flow of intercooler cooling water through the intercooler heat exchanger as needed.

PLANT CONDITIONS PRIOR TO EVENT

Prior to the event, which began on August 19, 2019, WCGS was in Mode 1 operating at 100 percent power. No other structures, systems, or components (SSCs) were inoperable at the start of this event which contributed to this condition.

EVENT DESCRIPTION

On August 19, 2019, at 0217 Central Daylight Time (CDT), the alarm for high intercooler water temperature was received during performance of the monthly operability run for the 'A' EDG. The 'A' EDG was declared inoperable due to high intercooler water temperature 6 minutes later at 0223 CDT. Condition B of Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1, "AC Sources – Operating," was entered at this time. The 'A' EDG was unloaded and stopped 2 minutes later at 0225 CDT.

It was identified that the immediate cause of the high intercooler water temperature was that flow through the intercooler heat exchanger had been lost. The intercooler temperature control valve failed in its bypass position, thus causing the flow of cooling water to bypass the intercooler heat exchanger. Investigation into this issue found that the thermostatic actuating devices (commonly termed "power pills") inside the temperature control valve had failed. The power pill is a device which contains a temperature sensitive metal/wax solution that expands with increasing temperature and provides the motive force to lift the controlling valve element off its seat. The power pills have rubber diaphragms which if degraded, could allow the metal/wax solution to leak out and prevent the stem movement when the pill is heated, thus preventing the valve from actuating.

By responding and shutting the 'A' EDG down in a timely manner, there was no damage induced by the failure of the temperature control valve. Based on inspections, trending, vendor input, and design review, the only components that needed to be replaced were the three power pills inside the temperature control valve. Industry operating experience and discussions with the vendor indicated that had the 'A' EDG not been shutdown in a timely manner, severe damage could have resulted.

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Wolf Creek Generating Station	05000-482	YEAR 2019	SEQUENTIAL NUMBER 002	REV NO. 00

NARRATIVE

A review of operating experience discovered that Wolf Creek Nuclear Operating Corporation (WCNOC) personnel had been procuring the power pills commercial grade and then doing commercial grade dedication in-house. This is an outlier in the industry. Most of the industry procures the power pills as safety-related components from the vendor. As part of the commercial grade dedication process, WCNOC had been performing acceptance testing, as well as annual shelf-life testing. The manufacturer does not have a shelf-life requirement for these components. Rather, the industry accepted critical test of these components is to perform testing within 4 weeks prior to installation.

The commercial grade dedication test instructions state to use a thermal water bath for the test fixture to achieve different temperatures but does not specify what type of water or how to cool the bath. Reviews of past testing work orders and discussions with the craft, revealed that for the performance of the acceptance and shelf-life testing, tap water had been used for the heated thermal bath, and the thermal bath was cooled using ice placed in the water. Per discussions with the vendor and other industry personnel, using ice to cool the bath, as well as the use of impure tap water, are not good maintenance practices and could contribute to prematurely aging the rubber diaphragm.

The onsite dedication acceptance and annual shelf life testing submits the rubber diaphragms to additional thermal cycles. The additional thermal cycles and subsequent drying out of the rubber diaphragm leads to accelerated degradation and embrittlement of the rubber elastomers. Disassembly investigation of the failed power pills from the intercooler water heat exchanger temperature control valve revealed that the rubber diaphragms did indeed have indications of pitting and erosion which caused the metal/wax solution to leak out thus preventing the valve from actuating.

A review of the stock item history for the failed power pills revealed that these had been installed for 3.8 years, and prior to installation had been subjected to 4 tests by WCNOC personnel. These temperature control valves are rebuilt with a frequency of 4.5 years, which is consistent with the industry recommended replacement frequency for these power pills of 3-5 years

An extent of condition review shows that these power pills are used in the equivalent application for the 'B' EDG, and in two other valves for both trains of EDGs (jacket water heat exchangers and lube oil coolers). All of the power pills used in valves for both EDGs will be replaced with new ones procured as safety related during their scheduled maintenance outages in 2020.

Upon completion of the previous successful 'A' EDG operability run on July 15, 2019, the power pills would have returned to ambient temperature. Due to the probable failure mechanism of accelerated aging, it was likely that going through the temperature changes associated with starting and running the EDG on August 19, 2019 was the proximate cause of the failure of the power pills. Therefore, once the power pills returned to ambient temperature following the test on July 15, 2019, they would have been susceptible to failure at any time the 'A' EDG would have been called upon. As such, it is likely that the 'A' EDG would not have been able to perform its intended function to provide emergency A/C power for its 7-day mission time between July 15, 2019, and its successful restoration on August 20, 2019.

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				2019	002	00

NARRATIVE**BASIS FOR REPORTABILITY**

Because the 'A' EDG was not capable of performing its intended function between July 15, 2019 and August 20, 2019, it was inoperable for longer than the time allowed by TS 3.8.1 Condition B. Therefore, this event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as an event or condition prohibited by TS. In addition, the 'B' EDG was out of service for normally scheduled maintenance for approximately 2 days from July 29, 2019 until July 31, 2019. Therefore, this event is also being reported in accordance with 10 CFR 50.73(a)(2)(v) as an event or condition that could have prevented fulfillment of a safety function of structures or systems that are needed to (A) shutdown the reactor and maintain it in a safe shutdown condition, and (D) mitigate the consequences of an accident.

CORRECTIVE ACTIONS**Immediate:**

The power pills were replaced in the intercooler heat exchanger temperature control valve for the 'A' EDG and the EDG was returned to service on August 20, 2019.

Planned:

A purchase order has been issued to procure new power pills as safety related components directly from the vendor. The existing stock of power pills will be discarded as the new ones are received. All of the power pills currently installed will be replaced during maintenance outages in 2020.

Completed:

The pre-installation testing work instructions have been enhanced to clarify that demineralized water shall be used for the thermal bath, and to not use ice to cool the thermal bath. The annual shelf life testing PM has been deleted.

SAFETY SIGNIFICANCE

Both offsite power sources remained operable during the time between the successful run of the 'A' EDG on July 15, 2019 and the restoration of the 'A' EDG following the TCV failure on August 20, 2019. As prerequisites to performing maintenance on the 'B' EDG on July 29, 2019, entry into the Wolf Creek switchyard was restricted, and any work which could challenge the operability of either of the offsite sources of power was minimized. In addition, the station blackout diesel generators were available, and these can provide reliable power to either Class 1E 4.16 kV bus. Due to the operability of both redundant offsite sources of power, as well as the availability of the SBO DGs, there was no adverse impact on the public health or safety.

OPERATING EXPERIENCE/PREVIOUS EVENTS

A review of the past three years at WCGS identified no similar events with the temperature control valves on any of the heat exchangers for either of the EDGs. These are the only applications at WCGS which use the temperature control valves with these power pills.